ABSTRACT:

Graph theory has many real-world applications and is rich in theoretical results, especially for studying interconnection among elements in natural and man-made systems. In recent studies of complex control system, directed graph was introduced to define and interpret the interconnection structure underlying the dynamics of the interacting subsystems. Similarly, Fuzzy State Space Model (FSSM) was developed for solving inverse problem in multivariable control system. Thus, this paper aims to describe the transformation of FSSM of a Boiler system using a graph theoretic approach. The main subsystems of the Boiler system are furnace, superheater, drum, riser and reheater. These subsystems are transformed into vertices whereas the interconnections between subsystems are associated with edges of the graph. Here, the Autocatalytic Set (ACS) is a subgraph, whereby each of the nodes has at least one incoming link from a node belonging to the same subgraph. The concept of ACS is integrated to reveal some properties of the new graphical representation of FSSM such that irreducible graph, adjacency matrix and the relationship of an ACS to Perron Frobenius Eigenvector. These properties indicate initial findings that will lead to further exploration in Fuzzy Graphical representation.